ATOMIC ENERGY *Letter*

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Dear Sir:

Expansion and acceleration of the U.S. atomic weapons program has now made necessary a new regional operations division in Santa Fe Operations, USAEC. The new division will direct planning, engineering and construction programs at outlying installations of this New Mexico office. Now, Santa Fe Operations is concerned with a diversity of atomic weapons projects: research, procurement, assembly, testing, etc. It maintains jurisdiction over such dissimilar enterprises as Los Alamos Scientific Laboratory; Bikini Atoll atomic weapons test station; and the Salton Sea, Calif., station.

General Electric Company's contract to operate Hanford Plutonium Works, and the town of Richland, will be extended from this Dec. 31st, when it is due to expire after four & one-third years. Now, a 6-month interim agreement has been made, until details still under discussion are ironed out. (Under its expiring contract, which covers both Hanford & Knolls Atomic Power Laboratory at Schenectady, G-E is reimbursed for all its costs and expenses. Payment for overhead includes factory overhead allowances for various departments ranging from 101% to 123% of direct labor costs, subject to revision at 6-month intervals. For administrative overhead, a lump sum of $200,000.00 a month is paid. The contract stipulates, however, that on settlement of the contract, if Government payments exceed G-E's total costs and expenses, the excess is paid back to the Government.)

Ten million dollar patent suit against U.S., instigated by G. M. Giannini & Co., Pasadena, Calif., instrument manufacturer (AEN: 9/12/50, p.1), and filed as a claim for patents used by the USAEC and its predecessor, Manhattan Engineer District, saw the withdrawal by Giannini last week. It is believed, however, that the suit, which covers the production of radioactive substances, may be continued by the other respondents associated with the Giannini firm in the claim.

Aluminium Ltd., Canada, is now the 27th "industrial sponsor" of the University of Chicago's research institutes in nuclear science and metals; it recently became an industrial member of the Institute for the Study of Metals. This Institute, together with the Institute of Radiobiology and Biophysics, and the Institute for Nuclear Studies, is supported by annual research grants from industry of over $750,000.00. The three Institutes form together the University of Chicago's $12.5 million postwar program for basic scientific research and the investigations of the peacetime potentialities of the atom.

First in a series of instruction courses which will prepare professional nurses for atomic attack emergencies began last week in Rochester, N.Y., under the auspices of the National Security Resources Board. The courses are being given in 6 regional centers throughout the U. S.

Subscription rates: United States, U.S. possessions, and Canada, $18.00 a year. Latin America, $20.00 a year. All other countries, $25.00 a year.

NUCLEAR REACTOR PROGRAM OF THE UNITED STATES.--A talk delivered by L. R. Hafstad, Director, Division of Reactor Development, USAEC, before the American Petroleum Institute, Los Angeles, Nov. 15, 1950. (The following is a digest specially prepared for readers of this LETTER.)

Today's nuclear reactor problems fall into two main categories; technical and economic.

TECHNICAL- In this phase, there are the problems of: (1) Materials which can withstand temperatures of nuclear reactions; which show minimum radiation damage under bombardment by neutrons, gamma-rays, etc., and which do not absorb and waste an excessive proportion of available neutrons. (2) Shielding people and instruments from harmful radiation. (3) Control gear with response time adequate for safety. (4) Heat transfer rates infinitely higher than ordinarily encountered. (5) Control of radioactive materials produced during fission, and deposited with the fuel elements to the detriment of the neutron economy. (6) Handling and disposal of radioactive wastes. The National Laboratories have worked on these problems since 1945. Progress made, however, can only be assessed by field trials.

These field trials will be on the four nuclear reactors now being built at Arco, Idaho--(1) The high neutron flux, materials testing reactor, (2) the prototype submarine propulsion reactor, in the slow neutron energy range, (3) the experimental breeder reactor, in the fast neutron energy range, and (4) the ship propulsion reactor, in the intermediate neutron energy range. Construction is slightly, but not seriously, behind schedule. Typical of the many things causing delays was the need to produce beryllium in pure form, and in ton quantities, for structural purposes. Other delays were due to procurement difficulties of tanks, pumps, valves, etc.

Now, we must wait until these nuclear reactors are past the debugging stage, and in actual operation, before they, and the research preceding them, can be evaluated.

ECONOMIC- Currently, the best available yardstick for cost of electrical power from nuclear reactors (other published figures differ widely and are unreliable) is the ship propulsion reactor (as above). A rough figure for this is $1400.00 per kwh installed capacity for nuclear power, as against $133.00 for the corresponding equipment of a conventional power plant. Savings can be made; it is my personal opinion that fastest progress dictates design and construction of reactors on a competitive-bid, fixed-price basis, or by otherwise using the profit incentive.

Even nuclear fuel problems are not negligible. Using $20/gram for nuclear fuel (and as high grade uranium ore runs out, this cost will go up), we get a fuel cost of one mill/kwh, as compared to two mills/kwh for chemical fuels. Thus, for single purpose nuclear reactors, burning U-235, fuel costs will be about the same as for conventional power plants, while the cost of the installation, and probably its operation, will be considerably higher. Exact costs await completion of nuclear reactors being built.

Reactors producing plutonium, which now throw away their heat, are another way to attack power costs. Using this heat to produce power, or for some other industrial purpose, the value of the plutonium produced would take care of much of the operating costs, and might provide power at a reasonable charge.

FUTURE PLANS- A nuclear reactor which will permit testing the knowledge, predictions and techniques of the homogeneous reactor approach has been authorized by the USAEC for construction. It will be similar to the experimental breeder reactor. Still another experimental reactor, designed for the highest temperatures which could conceivably be obtained with "soon to be available" materials is on the drawing boards. Beyond this, a confusing array of still other reactors is being "talked about".

TRENDS- Now, it is not a question of whether nuclear power reactors can be built. Today, it is which should be built, and which will prove most economical. Of interest is the trend toward complex multi-purpose reactors, with civilian power probably emerging first as a by-product from production reactors, and perhaps ultimately in its own right.

NEW PRODUCTS. PROCESSES, & INSTRUMENTS...for nuclear work...

FROM THE MANUFACTURERS- Designed for the airborne measurement of radioactivity, the type 154 scintillation counter system consists of a scintillation detector head, coincidence amplifier, built-in ratemeter, and an external recorder. The coincidence amplifier contains necessary high-voltage power supplies for the photomultiplier tubes and vacuum-tube plate supplies, individual channel amplifiers, a coincidence circuit, and a ratemeter circuit. Within the scintillation detector head are the photomultiplier tubes, necessary voltage ladders, and the scintillating phosphor. (Choice of phosphor utilized, and the directional shielding, vary with the particular application for which the instrument is to be used. Manufacturer states, however, that all designs to date have incorporated large phosphors, and the 5819 -type tubes in order to realize the maximum counting volume and radiation sensitivity.)--W. S. MacDonald Co., Cambridge 38, Mass.

Counter tubes, halogen quenched, which manufacturer states to have uniform, stable characteristics, unaffected by use, and which cannot be damaged by sustained over-voltage. Designed for incorporation in instruments; exhaust tip protected by screwed-on terminal cap.--Anton Electronic Laboratories, Brooklyn 6, N. Y.

INSTRUMENT DEVELOPMENT- A device (the "Penetron") utilizing gamma radiation, which enables the engineer to inspect, by non-destructive methods, tube and pipe walls, especially to discover reductions of wall thickness with service, has been developed by the Texas Co. Two heads enable the device to be used either for tangential operation, or inside the pipe or tube. Radium, and a detector, are so arranged in the device that absorption of radiation, by interposed metal, or backscattering, may be interpreted as an indication of the thickness of a pipe or metal plate. (See: Patent Digest, this LETTER, for basic Texas Co. patents on this instrument.)

NEWS AND NOTES- An export license was recently issued to the High Voltage Engineering Co., Cambridge, Mass. covering the shipment of a 2 Mev Van de Graaff machine to the Universidad Nacional Autonoma de Mexico (National Autonomous University of Mexico) Mexico City, Mexico. The University, which is operated under the general direction of the Mexican Ministry of Education, will use the machine in fundamental physical research.

NEW BOOKS & OTHER PUBLICATIONS...in the nuclear energy field...

The H-bomb. A collection of non-technical articles on the subject, which have already appeared elsewhere. Authors range from Hans Bethe, to the Alsop Brothers, columnists. Introduction by Albert Einstein. 175 pages. --Didier Publishing Co., 660 Madison Ave., New York 21. ($2.50)

Progress in Nuclear Physics. Edited by O.R. Frisch. Useful to the physicist in finding information in fields adjacent to his own; for the scientist, an introduction to some techniques in nuclear physics. 215 pages. 107 illus. --Butterworth's Scientific Publications, Ltd., London, W. C. 2(46s.)

Effect of Beta Radiation on Nucleic Acid Synthesis in Larvae of Drosophila Melanogaster, by J. M. Pirrung, & C. C. Hassett. Work done by Chemical Corps, U. S. Army Chemical Center, Md. 12 pages, with graphs & bibliography. Order as PB-100921. Microfilm, $1.75. Photostat, $2.50.....Automatic Exposure Device in Radiography. Apparatus developed during 1941-5 by Siemens-Reiniger-Werke A. G., Erlanger, Germany. Text in German. Photos and diagrams. Microfilm, $1.25. Enlarged print, $2.50. Order as PB-101277.....Note-These two PB reports available from Library of Congress, Photoduplication Service, Washington 25, D. C.

Handbook of Chemical Methods for the Determination of Uranium in Minerals and Ores, by F. H. Burstall, and A. F. Williams. Methods for chemical analysis of any type of mineral or ore containing from 0.1% uranium oxide to high grade pitchblende which may contain 80% uranium oxide. The methods are based on the result of 4 years experience at the Chemical Research Laboratory, of the Department of Scientific and Industrial Research, and include new chromatographic techniques developed for the detection of uranium and other minerals. -- His Majesty's Stationery Office, London, Eng.(1s. or 30¢)

RAW MATERIALS..radioactive ores & other materials for nuclear work...

UNITED STATES- Marysvale, Utah: Additional exploratory diamond drilling will be contracted for by the USAEC, in the uranium district here. Under terms of the work, a minimum of 8,000-feet, and a maximum of 15,500-feet of core and non-core drilling are to be done.....The McIntosh-Henry claims in the Marysvale district have been leased to a group of Utahns who have acquired control of Magnolia Lead Co., from Austin B. Smith, Salt Lake City. According to a company spokesman, the new group has a churn drilling program underway at Marysvale, and also has acquired the Desolation claims in the Temple Mountain area, with values in carnotite and autunite.

CANADA- Encouraging results from underground work at Eldorado Mining & Refining (Canadian government-owned) operations at Beaverlodge Lake, northern Saskatchewan, were recently reported by W. J. Bennett, Eldorado president. The Ace shaft, completed to a depth of 459-feet, has approximately 4,500-feet of lateral development on the first and second levels. The two areas of mineralization, which surface drilling had indicated, and which have now been exposed, contain pitchblende widely distributed as seams and thin plates along the shatter and shear planes of the rock. At the Eagle shaft, approximately 5 miles northwest of Ace, some 3,800 feet of lateral development, and 8,200 feet of drilling, had been completed the end of October. Here, pitchblende is found in narrow vein shears, located in two zones. Intensive development programs have been laid out for both the Ace and the Eagle shafts, and a mill may be constructed if ore tests warrant.

FRANCE- Important occurrences of beryllium minerals are reported to have been found in the commune of Bessines, in the Haute-Vienne.

ATOMIC PATENT DIGEST...latest U. S. applications & grants...

APPLICATION- Method of producing thin films of radioactive compounds suitable for isotopic analysis, and method of analyzing radioactive isotopic mixtures. A determinable quantity of a composition containing the isotope is formed on a smooth surface. The radioactivity of the sample is measured and compared with a standard of known isotopic abundance. Pat. Application No. 786, 880, assigned to United States of America (USAEC).

GRANTS- Method of making a radioactive device, essentially a silver carrier, which has an external, adherent layer. The layer is a mixture of metallic silver, and radium carbonate, with the mass of the silver greater than the mass of the radium in the radium carbonate. In the method, silver carbonate and radium carbonate are co-precipitated from an acqueous solution of silver nitrate and sodium nitrate, by means of a water soluble carbonate. The silver, in the silver carbonate--and the radium, in the radium carbonate--are in the proportions desired in the final layer. Separation, drying, and heat treatment of the precipitate produces the metallic silver; the heat is kept below that at which radium carbonate is decomposed. U. S. Pat. No. 2,525,035, issued Oct. 10th, 1950; assigned to Canadian Radium & Uranium Corp., New York, N. Y.

Method of measuring variations in the thickness of the wall of an object. Comprises placing a source of penetrative radiation at one side of a wall, placing a detector of such radiation on the other side of the wall, and exactly opposite, and measuring variations in the intensity of the radiation reaching the detector while moving the source and the detector about over the opposite surfaces of the wall. The measured radiation is an indication of both the change in the amount of wall material and the distance separating the detector from the source. U. S. Patent No. 2,528,724, issued Nov. 7th, 1950; assigned to The Texas Company, New York.

Pulse height analyzer, essentially an impulse discriminating and counting system. Comprises several electronic channels, a flip-flop circuit in each of the channels, and means for biassing the flip-flop circuits in each channel, with a selected value of potential different from the value of potential in the other channels. Means connected to each flip-flop circuit lock it in its unstable state for a selected interval. U. S. Pat. No. 2,529,666, issued Nov. 14th, 1950; assigned to United States of America (USAEC).

RADIATION & RADIOISOTOPES...investigations & notes...

RADIOISOTOPES- Methods have been evolved by L. D. Marinelli and Ruth F. Hill, Sloan-Kettering Institute, N.Y., by which dosage in iodine-131 therapy can be estimated not only for the tumor (toward which the therapy is directed) but for certain other organs, and for the body as a whole. Using these methods, a rough estimate was made of the maximum possible radiation dosage delivered to blood, kidney, mouth and stomach, in patients undergoing I-131 therapy. It was found that, on the average, a total body radiation dose of 108 er (equivalent roentgens) results from the administration of 100 mc of I-131. For the same amount of I-131, the average maximum dosages were found to be 757 er for the kidneys, 771 er for the gastric juice, and 2,020 er for the mouth.

Radioactive phosphate, used in fertilizer tests, has been of considerable utility during the two years it has been used for tracer purposes at the Georgia Experiment Station, according to that agricultural research group. Newest radioactive material to be used here is radioactive chlorine (Cl-36). It is being used in an effort to determine, in peanut protein, some of the amino acids which cannot be determined by the usual chemical methods.

RADIATION- Use of the 24 Mev betatron at the University of Illinois College of Medicine was described last week in St. Louis by Dr. Roger A. Harvey, professor of Radiology at Illinois. Dr. Harvey told the St. Louis Radiological Society, meeting in that City, that he felt the medical betatron could best serve for such things as breast cancer, where by voltage adjustment, the beam could be stopped short of the ribs, without going through the whole lung field. He said that in the past year and one-half, thirty-one patients had been treated with the betratron. The chief type of cases treated have been brain tumors, deep mouth and throat cancers, and lung and bladder cancers.

GREAT BRITAIN...nuclear energy activities....

Thio-urea, some cyanide derivatives, and certain other bio-chemicals have been found to be preventive against radioactivity if they are introduced into the human body before exposure, Dr. J. Loutit, of the Atomic Energy Research Establishment (AERE), Harwell, told a Conference on "Biological Hazards of Atomic Energy" in London recently. He explained at the conference (jointly sponsored by the Institute of Biology and Atomic Scientists Association) that the percentage of protection of these substances varied greatly; they afforded at present no more than a 15-20% measure of protection. He said the figure had been increased to 100% under strict laboratory conditions, but all the substances which had been tried out in the laboratory were in themselves strongly toxic. Much of the experimentation, he stated, had been done by Professor Back, of Liege.

Discussing istopes after this Conference, Sir John Cockcroft, AERE Director, said Harwell authorities had been "to some extent disappointed" at the number of industrial firms who had taken advantage of the availability of isotopes. He noted that industrialists were being provided with the necessary technical information through a small group which had been set up at Harwell especially for that purpose. In addition, a training course for people from industrial firms, on the use of radioisotopes in industry, was shortly to be started. (According to Ministry of Supply figures, 20 firms ordered isotopes for industrial use in May, of this year; 27 in June; 47 in July; and 53 in August. During August, a typical month, these 53 firms took 429 deliveries of isotopes, consisting, in the main, of 785 mc of radiophosphorous; 254 mc of radioiodine; and a small amount each of radiocobalt and radiocarbon.)

Of the people working in Britain's atomic energy establishments, about 75% are getting about 1/5th the radiation they could tolerate, W. Binks, National Physical Laboratory, said at the Conference. He observed that this percentage was also true for hospital radiographers, and others in similar activities.

Sincerely,

The Staff,
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